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Triggering phase-coherent spin packets by pulsed electrical spin injection across an Fe/GaAs Schottky barrier[1] B. BESCHOTEN, L.R. SCHREIBER, C. SCHWARK, G. GUENTHERODT, Physikalisches Institut IIA, RWTH Aachen University, 52056 Aachen, Germany, C. ADELMANN, C.J. PALMSTROM, Department of Chemical Engineering and Material Science, University of Minnesota, Minneapolis 55455, X. LOU, P.A. CROWELL, School of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota 55455 — The precise control of spins in semiconductor spintronic devices requires an electrical means for generating spin packets with a well-defined initial phase. So far, ultrafast laser pulses have successfully been used to trigger the ensemble phase of optically generated spin packets. However, electrical methods for ensemble phase triggering remain challenging. Here, we use fast current pulses to inject phase triggered electron spin packets across an Fe/GaAs Schottky barrier into n-GaAs. We demonstrate phase coherence by the observation of multiple Larmor precession cycles for current pulse widths down to 500 ps at 20 K. We show that the current pulses are broadened by the charging and discharging time of the Schottky barrier. At high frequencies, the observable spin coherence is limited only by the finite band width of the current pulses, which is on the order of 2 GHz.

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